REMARKS

At the time the present Office Action issued, claims 1 to 24 were pending.

Allowed subject matter

As stated in Numbered paragraph 7 of the Office Action, claims 7 to 12, 16-17, and 22-24 currently stand allowed.

The Examiner is respectfully thanked for his diligent consideration.

However, in order to avoid unnecessary prosecution history estoppel, Attorney for Applicant hereby comments on the statement of reasons as provided by the Examiner.

The statement of reasons in respect of claims 7-12 defines "the improvement" to comprise connecting tubulars that are irregular in shape and multibore each comprising an enveloping pipe and one or more partitioning walls, which divide the interior of the enveloping pipe into at least two semi-cylindrical segments and multibores formed by pipe bundles having the walls of the adjacent pipes in electrical contact with each other.

However, the given definition of "the improvement" invokes features that are not common to each of the claims 7 to 12. Of the mentioned features, only "interconnecting tubulars that are irregular in shape" is common to each of these claims, because at least claim 7 lacks the other mentioned features. Hence, the other mentioned features should not be considered when defining a statement of reasons for allowance of claim 7.

Moreover, Attorney for Applicant respectfully submits that the claims contain additional features, other than those mentioned by in the statement of allowability, that also render the claim allowable, such as is argued in respect of the features of claim 1 and such as the positioning on the electrodes at selected angular intervals.

The statement of reasons in respect of claims 16-17 and 22-24 defines "the improvement" to comprise a flushing mixture made of a liquid or solid reducing agent which is painted or sprayed at the tubular ends and an inert gas is injected into space, whereupon the reducing agent is at least partly evaporated when the tubular ends are heated and the evaporated reducing agent is mixed with the injected inert gas to form in-situ a flushing gas mixture comprising less than 25% by volume of evaporated reducing agent and more then 75% by volume of a substantially inert gas; wherein the liquid or solid reducing agent comprises a cleaning liquid, such as hydrochloric acid, and a reducing agent, such as hydrogen peroxide, borax powder and/or an alkaline or beryllium hydride.

Applicant traverses this definition, because it invokes features that are not common to each one of the claims 16-17 and 22-24. Of the mentioned features, only "a flushing mixture made of a liquid or solid reducing agent which is painted or sprayed at the tubular ends and an inert gas is injected into space, whereupon the reducing agent is at least partly evaporated when the tubular ends are heated and the evaporated reducing agent is mixed with the injected inert gas to form in-situ a flushing gas mixture comprising less than 25% by volume of evaporated reducing agent and more then 75% by volume of a substantially inert gas" is common to each of these claims, because at least claim 16 lacks the other mentioned features.

The remaining mentioned features should not be considered when defining a statement of reasons for allowance of claim 16.

Moreover, Attorney for Applicant respectfully submits that the claims contain additional features, other than those mentioned by in the statement of allowability, that also render the claim allowable, such as is argued in respect of the features of claim 1.

Rejected claims

The remaining claims, claims 1 to 6, 13 to 15, and 18 to 21, currently stand rejected.

Claim amendments to overcome rejections under 35 USC § 112

In Numbered paragraph 1 of the Office Action, claim 20 has been rejected under 35 USC § 112, second paragraph. In order to overcome the rejection, the following amendments have been made:

Antecedent basis has been introduced for the terms "tubular end", "wall", and "heated tubular ends". The term "the tubular segment" has been replaced by "a tubular segment" to accommodate antecedent basis. These amendments, which do not constitute an addition of matter, overcome the rejection of claim 20.

It is respectfully submitted that similar amendments were made to claim 1 in response to a previous Office Action, and have lead to withdrawal of the rejections under 35 USC § 112.

Arguments traversing claim rejections under 35 USC § 103

Claims 1-6, 18, 20 and 21

In Numbered paragraph 4 of the present Office Action, claims 1-6, 18, 20 and 21 have been rejected under 35 USC § 103(a) as being unpatentable over Moe (US Pat. 4,736,084) in view of Brennan *et al.* (US Pat. 5,347,101).

Attorney for Applicant respectfully traverses the rejections.

The stated grounds supporting the rejections are identical to those presented in the previous Office Action and will not be repeated here in full.

However, the Examiner also added arguments, in Numbered paragraph 8, which either change the stated grounds supporting the rejections or are not consistent with the stated grounds.

Numbered paragraph 8 states that the Examiner maintains the fact that Moe teaches the subject matter of the claimed invention.

This is not consistent with Numbered paragraph 4 where it is stated "Moe does not teach ...".

Numbered paragraph 8 further states that "The argument regarding the gap in the methodology of Moe is not pertinent to the claims".

It is respectfully submitted that the statements regarding the gap were not made in retrospect of the claims, but to show that Brennan *et al* teach away from Moe. The work pieces in Brennan *et al* are required to be in close contact with each other during the repetitive heating up and melting under the welding heads. This teaches away from the requirement of Moe to have a gap between the tubular ends present, so that the skilled artisan would be taught away from combining the references.

Next, the Examiner states that arc welding and resistance welding are analogous welding techniques in the same art. This statement is incorrect. As explained in "Arc-welding fundamentals" by The Lincoln Electric Company, 1994, retrievable via http://www.lincolnelectric.com/knowledge/articles/content/arcweldfund.asp (printed copy enclosed), the intense heat needed to melt metal is produced by an electric arc. The arc constitutes an electric current flowing between the electrode and the work piece though an ionized column of gas, and is therefore formed between the actual work and an electrode.

Resistance welding, on the other hand, can be more uniform because the heat is generated by the electric current inside the workpiece, as explained by Moe.

This also makes clear that the electrodes in Brennan *et al* must be spaced at a certain distance from the tubular walls in order for the arc to exist, consistent with Brennan *et al*'s Figs. 4 to 6. This does not only show the Examiner's statement on Brennan *et al*'s teaching (Examiner stated that Brennan *et al* teach a plurality of welding heads against the tubular wall of pipes) to be incorrect, it also shows one more reason

why Brennan *et al* teach away from Moe, because the latter requires the electrodes to be attached to the tubular walls (see e.g. Col. 3 lines 9-17).

Next, the Examiner claims to "maintain the fact that one of the general principles of welding is to ensure uniform heating".

Firstly, it is respectfully submitted that reliance on this alleged fact has not been raised in any earlier Office Action so that the Examiner has no basis to "maintain" this fact.

Moreover, it is respectfully submitted that the alleged fact is not supported by a reference in the art of record. The Examiner thus seems to rely on a fact within the Examiner's own personal knowledge. Attorney for Applicant therefore respectfully requests that the reference be supported by an affidavit pursuant of 37 CFR §1.104(d)(2), or that the statement of fact will be withdrawn.

Next, the Examiner states that the mode of arrangement of the electrodes as described by Brennan *et al* (...) may ensure uniform local heating.

Attorney for Applicant respectfully submits that this is an interpretation of Brennan *et al* which seems to have come about using impermissible hindsight, for Brennan itself is fully silent on providing any reason for having welding heads at 60° circumferential spacing. The mere fact that the word "may" has been used already indicates that the interpretation is of speculative nature and not based on actual disclosure. In fact, there is no disclosure in Brennan *et al* that would suggest that the various welding heads somehow interact in their operation to create some synergy effect causing more uniform local heating. The local heating achieved by each weld head seems not affected at all by other weld heads which simply seem to far away, so there is no reason to believe that there is "more uniform local heating". Thus, alleged motivation to adopt the 60° circumferential spacing in Moe is not based on the cited art, as required to establish a *prima facie* case of obviousness.

Finally, Examiner has disagreed with an assertion that the process of Moe does not require intense heating. Attorney for Applicant respectfully submits that such assertion has never been made and hence nothing more needs be stated in this respect.

In conclusion, it is respectfully submitted that Applicant still believes that no *prima facie* case of obviousness has been established against claim 1 nor any of its dependent claims, for lack of having shown motivation to combine the references Moe and Brennan *et al*. In fact, Attorney for Applicant has shown that Brennan *et al* even teach away from Moe in various ways. Examiner cannot rely solely on Brennan *et al*'s disclosure for finding motivation to combine, for it does not give any positive reason for applying six weld

heads, let alone that it discusses uniformity of heating, that would offset the teaching away that clearly is present.

If Examiner wants to rely on the asserted fact that it is one of the general principles of welding to ensure uniform heating, finality of the rejections should be withdrawn. Moreover, support by a reference or affidavit would then be required under 37 USC §1.104(d)(2).

Claims 13-15

In Numbered paragraph 5 of the Office Action, claims 13-15 have been rejected under 35 USC § 103(a) as being unpatentable over Moe in view of Brennan *et al.* as applied to Claim 1 above, and further in view of Flood *et al.* (US Pat. 5,686,002).

Attorney for Applicant respectfully traverses the rejections.

Claims 13 to 15 depend on Claim 1. It has been shown above that no *prima facie* case of obviousness has been established regarding claim 1 on the basis of Moe in view of Brennan *et al.*.

The additional consideration of Flood *et al.* does not bring a *prima facie* case of obviousness against Claim 1 either, since it does not disclose three or more electrodes.

As the combination of Moe, Brennan *et al*, and Flood *et al* does not establish a *prima facie* case of obviousness against Claim 1, is does also not establish the *prima facie* case against Claims 13 to 15 either, because these claims contain the subject matter of Claim 1.

Therefore, withdrawal of these rejections is respectfully requested.

Claim 19

In Numbered paragraph 6 of the Office Action, claim 19 has been rejected under 35 USC § 103(a) as being unpatentable over Moe in view of Brennan *et al.* as applied to Claim 1 above, and further in view of Schaps *et al.* (US Pat. 5,652,389).

Attorney for Applicant respectfully traverses the rejections.

Claim 19 depends on Claim 1. It has been shown above that no *prima facie* case of obviousness has been established regarding claim 1 on the basis of Moe in view of Brennan *et al.*.

The additional consideration of Schaps *et al.* does not bring a *prima facie* case of obviousness against Claim 1 either, since it does not disclose a welding tool, let alone three or more electrodes for welding.

As the combination of Moe, Brennan *et al*, and Schaps *et al* does not establish a *prima facie* case of obviousness against Claim 1, it does also not establish the case against Claim 19, for this claim contains the subject matter of Claim 1.

Therefore, withdrawal of these rejections is respectfully requested.

Concluding remarks

Attorney has thus addressed each and every ground for objection and rejection raised by the Examiner in the Final Office Action. As may be concluded from the above, Attorney for Applicant respectfully submits that the present Response places the application in condition for allowance. Therefore, consideration of the amendment and arguments is respectfully requested. It will be understood that, primarily, issuance of a Notice of Allowance is requested.

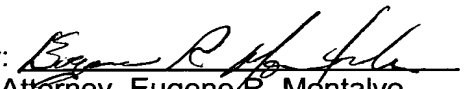
However, Attorney for Applicant also respectfully submits that the Finality of the rejection is improper because the Response to Applicant's Arguments section of the Final Office Action adds facts that go beyond those argued in the Rejections. The addition of these facts are considered to form new grounds that were not necessitated by Applicant's amendment nor based on information submitted in an IDS filed under 37 CFR §1.97(c).

Consequently, in the event that the Examiner is not yet convinced of the Allowability of the application, it is respectfully requested that the finality of the Office Action be withdrawn and a new Office Action is issued.

In the very least, entry of the Amendment is requested for it at least brings the application in better form for appeal.

In the event the Examiner has any questions or issues regarding the present application, the Examiner is invited to call the undersigned prior to the issuance of any written action.

Respectfully submitted,
Robert Andrew Alford *et al.*

By: 
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Arc-Welding Fundamentals

The Lincoln Electric Company, 1994.

Arc welding is one of several fusion processes for joining metals. By applying intense heat, metal at the joint between two parts is melted and caused to intermix - directly, or more commonly, with an intermediate molten filler metal. Upon cooling and solidification, a metallurgical bond is created. Since the joining is an intermixture of metals, the final weldment potentially has the same strength properties as the metal of the parts. This is in sharp contrast to non-fusion processes of joining (i.e. soldering, brazing etc.) in which the mechanical and physical properties of the base materials cannot be duplicated at the joint.

In arc welding, the intense heat needed to melt metal is produced by an electric arc. The arc is formed between the actual work and an electrode (stick or wire) that is manually or mechanically guided along the joint. The electrode can either be a rod with the purpose of simply carrying the current between the tip and the work. Or, it may be a specially prepared rod or wire that not only conducts the current but also melts and supplies filler metal to the joint. Most welding in the manufacture of steel products uses the second type of electrode.

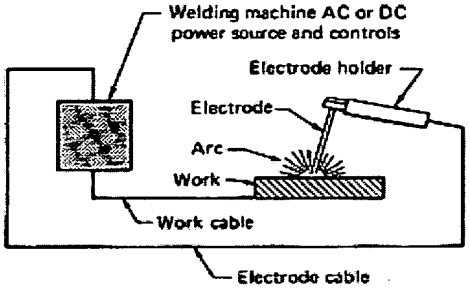

Fig. 1 The basic arc-welding circuit

Basic Welding Circuit

The basic arc-welding circuit is illustrated in Fig. 1. An AC or DC power source, fitted with whatever controls may be needed, is connected by a work cable to the workpiece and by a "hot" cable to an electrode holder of some type, which makes an electrical contact with the welding electrode.

An arc is created across the gap when the energized circuit and the electrode tip touches the workpiece and is withdrawn, yet still with in close contact.

The arc produces a temperature of about 6500°F at the tip. This heat melts both the base metal and the electrode, producing a pool of molten metal sometimes called a "crater." The crater solidifies behind the electrode as it is moved along the joint. The result is a fusion bond.

Arc Shielding

However, joining metals requires more than moving an electrode along a joint. Metals at high temperatures tend to react chemically with elements in the air - oxygen and nitrogen. When metal in the molten pool comes into contact with air, oxides and nitrides form which destroy the strength and toughness of the weld joint. Therefore, many arc-welding processes provide some means of covering the arc and the molten pool with a protective shield of gas, vapor, or slag. This is called arc shielding. This shielding prevents or minimizes contact of the molten metal with air. Shielding also may improve the weld. An example is a granular flux, which actually adds deoxidizers to the weld.

Figure 2 illustrates the shielding of the welding arc and

molten pool with a Stick electrode. The extruded covering on the filler metal rod, provides a shielding gas at the point of contact while the slag protects the fresh weld from the air.

The arc itself is a very complex phenomenon. In-depth understanding of the physics of the arc is of little value to the welder, but some knowledge of its general characteristics can be useful.

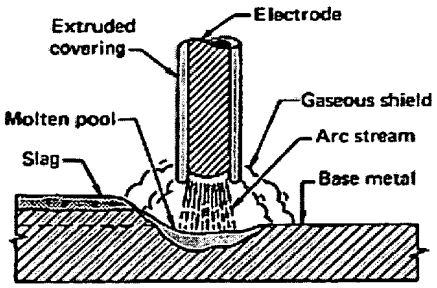

Fig. 2 This shows how the coating on a coated (stick) electrode provides a gaseous shield around the arc and a slag covering on the hot weld deposit.

Nature of the Arc

An arc is an electric current flowing between two electrodes through an ionized column of gas. A negatively charged cathode and a positively charged anode create the intense heat of the welding arc. Negative and positive ions are bounced off of each other in the plasma column at an accelerated rate.

In welding, the arc not only provides the heat needed to melt the electrode and the base metal, but under certain conditions must also supply the means to transport the molten metal from the tip of the electrode to the work. Several mechanisms for metal transfer exist. Two (of many) examples include:

1. Surface Tension Transfer® - a drop of molten metal touches the molten metal pool and is drawn into it by surface tension.
2. Spray Arc - the drop is ejected from the molten metal at the electrode tip by an electric pinch propelling it to the molten pool. (great for overhead welding!)

If an electrode is *consumable*, the tip melts under the heat of the arc and molten droplets are detached and transported to the work through the arc column. Any arc welding system in which the electrode is melted off to become part of the weld is described as *metal-arc*. In carbon or tungsten (TIG) welding there are no molten droplets to be forced across the gap and onto the work. Filler metal is melted into the joint from a separate rod or wire.

More of the heat developed by the arc is transferred to the weld pool with consumable electrodes. This produces higher thermal efficiencies and narrower heat-affected zones.

Since there must be an ionized path to conduct electricity across a gap, the mere switching on of the welding current with an electrically cold electrode posed over it will not start the arc. The arc must be *ignited*. This is caused by either supplying an initial voltage high enough to cause a discharge or by touching the electrode to the work and then withdrawing it as the contact area becomes heated.

Arc welding may be done with direct current (DC) with the electrode either positive or negative or alternating current (AC). The choice of current and polarity depends on the process, the type of electrode, the arc atmosphere, and the metal being welded.